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PACIFIC AIR FORCES INSTRUCTION 15-101

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Weather

WEATHER SUPPORT FOR PACAF

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This instruction implements **AFPD 15-1**, *Weather Operations;* **AFI 15-114**, *Functional Resource and Weather Technical Performance Evaluation;* **AFI 15-128**, *Air Force Weather Roles and Responsibilities;* **AFMAN 15-129V1**, *Air and Space Weather Operations – Characterization;* **AFMAN 15-129V2**, *Air and Space Weather Operations – Exploitation;* USPACOMINST 0539.1, *Tropical Cyclone Operations;* and USPACOMINST 0539.2, *Meteorological and Oceanographic (METOC) Support to Joint Operations in U.S. Pacific Command (USPACOM).* This instruction provides basic responsibilities for weather support to Pacific Air Forces (PACAF) and forces from other commands operating in the PACAF AOR (excluding Air Mobility Command (AMC) strategic airlift resources). Responsibilities for the Tropical Cyclone Reconnaissance Network (TCRN) for USPACOM are included in this instruction. This publication applies to all PACAF weather units and other PACAF units maintaining systems supporting the TCRN. It also applies to Air National Guard (ANG) units and members of PACAF-gained Air Force Reserve Command (AFRC) units when they are mobilized in support of PACAF. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records,* and disposed of in accordance with the Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS). Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. This publication may be supplemented at any level below HQ PACAF, but all direct supplements must be routed to the OPR of this publication for coordination prior to certification and approval. The authorities to waive wing/unit level requirements in this publication are identified with a tier ("T-0, T-1, T-2, T-3")

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SUMMARY OF CHANGES

This document has been substantially revised and should be reviewed in its entirety. Major changes include 17th Operational Weather Squadron (17 OWS) realignment under Air Combat Command (ACC), deploying weather personnel as part of a flying squadron package deployment, readiness reporting evaluation, 613 Air Operations Center (AOC) Weather Specialty Team (WST) responsibilities, and inclusion of quarterly manual observing requirements.

1. Background. HQ PACAF operates and maintains air forces in the Pacific, and other Air Force major commands dispatch forces to operate in the Pacific. PACAF weather units provide weather services to enhance safety of flight, increase flying training effectiveness, protect resources across the range of military operations, maximize supported units' operational effectiveness through timely exploitation of environmental intelligence, and facilitate the command and control of military operations. With a majority of the AOR consisting of ocean surface, tropical cyclone impacts to DoD installations are a significant threat in PACAF. Per PACAF and ACC MOU dated 16 Jun 2015, 17 OWS personnel performing duties at the Joint Typhoon Warning Center (JTWC) conduct tropical cyclone reconnaissance using data from satellite, radar, and other conventional sources to execute PACAF's Executive Agency Responsibility for Tropical Cyclone Reconnaissance. To ensure maximum exploitation of all USAF owned data sources across the AOR, HQ PACAF established the Tropical Cyclone Reconnaissance Network (TCRN) to provide a construct for effective management, coordination, and maintenance of systems and procedures supporting typhoon reconnaissance. The procedures, duties and responsibilities outlined in this instruction establish standards for consistent weather support throughout the command to include tropical cyclone operations.

2. HQ PACAF/A3TX (PACAF Weather Branch) Responsibilities. HQ PACAF/A3TX is responsible through the Operational Support Division (HQ PACAF/A3T) to the Director of Air and Cyberspace Operations (HQ PACAF/A3/6) for all MAJCOM weather staff responsibilities enumerated in AFI 15-128. The Weather Branch advises the PACAF Commander, HQ PACAF Directors, and HQ PACAF Division Chiefs on all aspects of PACAF weather support and operations that affect PACAF or PACOM forces. The Weather Branch also carries out these PACAF-unique responsibilities:

2.1. Provides C-MAJCOM staff support and non-operational weather subject matter expertise (SME) to Battlestaff (BS), AFFOR staff/JFACC, and Operations Planning Groups/Teams (OPG/T) as required.

2.2. Augments the Pacific Operations Support Center (POSC) and AFFOR in operations support positions during BS extended operations if required and 24-hour operations as tasked or Battle Rostered.

2.3. Assists with issues concerning PACAF Programming Plan, OPLAN, CONPLAN and strategic vision.

2.4. Provides HQ PACAF weather functional coordination with USPACOM, USARPAC, SOCPAC and PACFLT.

2.5. Assists PACAF staff agencies and PACAF weather units in documenting weather support requirements and environmental sensitivities of emerging acquisition programs.

2.6. Evaluates technical requirements and arranges environmental support for PACAF projects, studies or programs.

2.7. Coordinates with appropriate agencies as necessary to help the PACOM Senior METOC Officer and Joint METOC Officers achieve theater sensing strategies within the AOR.

2.8. Develops and/or coordinates on environmental and communications sections of contingency plans, and meteorological and oceanographic (METOC) support concepts for PACOM plans and supporting PACAF plans in Annex H.

2.9. Monitors weather support for exercises, crisis action responses and contingencies involving various commands in the USPACOM area of responsibility.

2.10. Monitors and updates the UTC Availability (UTA) Library for all required weather personnel and equipment changes.

2.11. Using the Defense Readiness Reporting Systems (DRRS), manages Designed Operational Capabilities (DOC) statements for PACAF weather units and coordinates on DOC Statements for Operations Support Squadrons (OSS) with weather forces assigned.

2.12. Monitors Air Force - Input Tool (AF-IT) resource and capability assessments within DRRS, and AEF Reporting Tool (ART) for weather squadrons and weather flights assigned to an OSS. Provides guidance to unit leadership or unit readiness monitors to address reporting errors or inconsistencies.

2.13. Advises PACAF weather units of environmental effects in support systems development, employment concept and operations.

2.14. Determines MAJCOM unique standards for all levels of weather unit operations and procedures, and informs PACAF weather personnel of new or updated higher headquarters procedures, policies and operational directives.

2.15. Incorporates PACAF weather requirements into the appropriate PACAF instructions, manuals, pamphlets, and supplements to higher headquarters directives.

2.16. Identifies PACAF environmental research and development or technique development requirements and forwards these to AF/A3W.

2.17. Serves as weather SME to PACAF/IG. Assists and augments as IG Augmentee. Conducts virtual and on-site Unit Effectiveness Inspections (UEIs).

3. 613 AOC/COD Weather Specialty Team (WST) Responsibilities. The AOC WST collects, tailors and integrates weather information to meet the short-, medium-, and long-range mission needs of the C/JFACC staff, the five AOC Divisions, Component Liaison Cells, and other specialty teams. The WST's focus is providing weather support for the planning and

execution of the Air Tasking Order (ATO) cycle. The WST also carries out these PACAF responsibilities:

3.1. Provides PACAF C/JFACC staff support and operational weather subject matter expertise (SME) to JFACC, AOC Divisions and other ATO-related functions as required.

3.2. Evaluates the impact of meteorological, oceanographic (METOC), and space environment effects on weapons systems and operations of both enemy and friendly forces across the PACOM theater of operations and the spectrum of all mission profiles from wartime to humanitarian assistance/disaster response (HA/DR).

3.3. Supports all aspects of mission planning, including target area weather information, predictions of weather impacts on weapons effectiveness, and weather impacts to ISR sensors. Weather-effect decision aids, including electro-optical and space weather effects guidance, will be provided for determination of timing as well as weapons planned for use.

3.4. Provides briefings to the AOC Director and C/JFACC staff, with updates as required, on significant METOC impacts to strategic and operational-level planning and execution.

3.5. Orchestrates the flow of weather information via whatever means necessary and exercises functional control over ALL weather personnel and equipment in the AOC.

3.6. Conducts quarterly/seasonal continuation training concentrating on environmental impacts associated with the upcoming season. Training and certification will be documented in the Air Force Training Records (AFTR) IAW the Career Field Education and Training Plan (CFETP).

4. Combined METOC Officer (CMO), Senior METOC Officer (SMO), Staff Weather Officer (SWO), Joint METOC Officer (JMO) Designations.

4.1. The Joint Forces Commander will appoint a JMO in accordance with Joint Publication 3-59 when required to support their operations. SMO, SWO and typical JMO designations for PACAF assigned weather units for the PACOM AOR are as follows:

4.1.1. 611 AOC. The 611 AOC/Weather Specialty Team (WST) Chief, Joint Base Elmendorf-Richardson, AK, is the SWO to the 11 AF/CC.

4.1.2. Det 3, 1 WS. The Det 3, 1 WS Commander, Fort Wainwright, AK, is the SWO for US Army Alaska (USARAK).

4.1.3. Det 1, 1 WS. The Det 1, 1 WS Commander, Fort Shafter, HI, is the SWO for US Army Pacific Command (USARPAC), to include the Main Command Post (MCP). In their capacity as a Combatant Command (CCMD) Army Service Component SWO, Det 1, 1 WS has above the line responsibilities similar to a MAJCOM such as coordinating and ensuring United States Army weather support needs are identified and captured in appropriate PACOM and subordinate command Time Phased Force and Deployment Data (TPFDD). While assigned to 1 WS, these duties impact more than 1 WS, and to be effective require direct coordination with the HQ PACAF weather functional staff, USARPAC deliberate and crisis action planners, 607 WS, and PACOM AOR OPLAN tasked CONUS Army Weather Squadrons via HQ ACC/A3W staff.

4.1.4. 374 OSS/OSW. The 374 OSS/OSW weather flight commander, Yokota AB, Japan, is the SWO to 5 AF and US Forces Japan (USFJ), and typically serves as JMO for operations and exercises within the USFJ area of operations.

4.1.5. OL-A, Det 1, 1 WS. The OL-A, Det 1, 1 WS, NCOIC, Camp Zama, Japan, is the SWO to US Army Japan.

4.1.6. 607 WS. The 607 WS/CC, USAG Yongsan, Korea, is the SWO for USFK, and typically serves as JMO for operations and exercises focused on the Korean Peninsula. Duties require coordination with the Commander United Nations Command/Combined Forces Command (COMUNC/CFC) Combined METOC Officer (CMO), which is the commander of the Combined Weather Squadron (ROKAF). The 607 WS/DO is the SWO to Commander, 8th Army.

4.1.7. 7 AF. The 7 AF Chief of Weather Operations, Osan AB, Republic of Korea, is the SWO to the Commander, 7 AF (AFKOR) and the Air Component SWO. If this position is vacant, this responsibility will be assumed by the 607 AOC WST Chief.

4.1.8. 1 WS. The 1 WS/CC, Joint Base Lewis-McChord (JBLM), WA, is the SWO for U.S. Army I Corps at JBLM.

4.1.9. PACAF/A3TX. The PACAF/A3TX, Chief, Weather Operations Branch, Joint Base Pearl Harbor-Hickam, HI, is the JMO for JTF-SFA (Support Forces Antarctica).

4.1.10. 613 AOC. The 613 AOC, Chief, Weather Specialty Team, Joint Base Pearl Harbor-Hickam, HI, is the SWO to the PACAF C/JFACC.

5. Weather Support Employment.

5.1. The effective employment of air forces requires consideration of weather factors from planning to execution. Weather information provided to the various organizational elements must support their decision-making processes and follow current regulatory guidance.

5.2. Sources of Weather Support. The OL, WF, Det, OWS, WS and strategic centers such as the JTWC are the primary sources for operational weather support. Installation units and agencies are permitted to consult various host nation and/or civilian agencies and sources to obtain weather situational awareness, but are required to use DoD sources for their operations. Though direct contact between USAF-supported units and indigenous weather personnel is permitted, supported units must realize that indigenous weather personnel may not be able to provide all the support they require, necessitating reach back options. Additionally, host nation weather personnel may not have access to U.S. forces' forecasts and other weather products produced specifically for DoD operations and may not be knowledgeable of mission-critical weather thresholds. There is also no mechanism available to enforce host nation weather support arrangements unless formally documented in an official Memorandum of Understanding International (MOUI).

5.3. Lead Weather Unit. PACAF has unique challenges in determining the Lead Weather Unit (LWU) to ensure appropriate weather support is provided per AFMAN 15-129V2, para 1.8.

5.3.1. Air Mobility Division (AMD), 613th Air & Space Operations Center (613 AOC) controls intra-theater airlift and air refueling missions and is supported by the 17 OWS as the regional weather provider. 17 OWS acts as LWU for these missions.

5.3.2. Combat Air Forces (CAF) theater aircraft Coronet movements are controlled by HQ ACC's Air Operations Squadron (AOS). Movements controlled by HQ ACC's AOS will be supported by ACC AOS Weather Flight. PACAF weather units will use ACC AOS/AOSW prepared briefing information available on their website **https://15ows.us.af.mil/TECH_REF/KLFI_UPLOAD/index.cfm?UID=10&BW=H&UF=M&AOR=1** to prepare/present any weather support/briefings for these missions. **(T-2)**.

5.3.3. Installation weather unit and OWS support to Integrated Flight Management (IFM) missions. The 17 OWS ensures Installation Data Pages (IDPs) with supported weather units that have IFM mission aircraft assigned to their installation (host or tenant unit) define whom the Lead Weather Unit (LWU) is in accordance with AFMAN 15-129V2. The defined support should not require the host weather unit to extend their duty hours to provide this support unless acting in a backup capacity for the 17 OWS. Local weather units (typically WFs, Dets, OLs) with IFM mission aircraft assigned to their installation will also detail the LWU roles and responsibilities for IFM missions in their local Weather Support Document (WSD) or equivalent document. **(T-2)**.

6. Commander Responsibilities.

6.1. Wing commanders are responsible for ensuring the weather support requirements of the wing, tenant and transient units are met using the "provide or arrange for" concept in AFMAN 15-129V2.

6.2. Commanders of PACAF flying units deploying within or outside the PACOM AOR (or theater), working through their home station OSS weather flight, will ensure weather support requirements for their unit at its deployed location (to include exercises) are met; typically by bringing aligned weather personnel. **(T-2)**. Commanders will take one to two of their aligned weather support personnel as designated in the 3-series Strike Mission Design Series (MDS) Unit Type Codes (UTC) and will not delete both of their aligned weather support (AFSC 1W051) unless coordinated through the PACAF Weather Readiness Functional Area Manager (FAM). **(T-2)**. If assigned weather personnel do not deploy, then the deployed unit's home weather unit will ensure the deployed forces receive weather support to accomplish their mission through a reach back capability to the home weather unit (for within PACOM AOR only), coordination with a weather unit at the deployed location, or the deployed location's supporting OWS. **(T-2)**.

6.3. Agencies requiring weather information will coordinate through their regularly supporting weather unit and clearly state their support requirements. **(T-2)**. Agencies will state the mission requiring support, type of information needed, frequency of delivery, update frequency and meteorological criteria, format, media, and preferred delivery method. **(T-2)**.

6.4. PACAF operational and tactical weather units will develop and administer weather indoctrination training for air traffic control personnel IAW **AFI 13-204V3** and **AFMAN 15-111**. This training should focus on the cooperative weather watch principle and provide a general overview of the types of weather, climatological summary of Visual Flight Rule/Instrument Flight Rule (VFR/IFR) conditions, types and location of weather equipment, basic and cooperative weather watch procedures, tower visibility, prevailing visibility and any observing limitations. **(T-2)**.

7. JTWC Area of Responsibility.

7.1. The Joint Typhoon Warning Center (JTWC), Pearl Harbor, HI, the Central Pacific Hurricane Center (CPHC), Honolulu, HI, and the National Hurricane Center (NHC), Miami, FL, issue tropical cyclone warnings and advisories. JTWC's area of responsibility (AOR) is from the East Coast of Africa to the West Coast of the Americas. CPHC issues civil tropical cyclone forecasts/advisories north of the equator between 180° and 140° W. NHC issues civil tropical cyclone forecasts/advisories north of the equator between 140° W and the West Coast of the Americas. JTWC retains responsibility for issuing its own tropical cyclone warnings if CPHC or NHC cannot issue warnings or if JTWC believes warnings from CPHC or NHC are not sufficiently accurate to protect DoD resources. In the CPHC and NHC AOR, JTWC will repackage the National Weather Service forecasts as warnings for DoD installation application/utilization. **(T-0)**.

8. Pacific Tropical Cyclone Reconnaissance Network (TCRN).

8.1. Per PACAF & ACC Memorandum of Understanding (MOU), 17 OWS, through JTWC, retains tropical cyclone reconnaissance responsibility in PACAF and any direction provided to the 17 OWS or JTWC is under the authority of the stated MOU. JTWC will produce tropical cyclone position and intensity estimates to execute the PACAF executive agency responsibility for tropical cyclone reconnaissance and forecast operations as defined in USPACOMINST 0539.1. These position and intensity estimates will be recorded on PACAF Form 413, *Tropical Cyclone Satellite Position/Intensity Log* (Attachment 2), or equivalent locally developed product or form. **(T-2)**.

8.2. The primary component of the TCRN is the MARK IVB (AN/UMQ-13 (V)) network. The JTWC Satellite Operations (SATOPS) Flight uses the MARK IVB client-server capability to access MARK IVB data to perform tropical cyclone reconnaissance.

8.3. Due to the criticality of these systems to the TCRN, the weather flights at Kadena AB, Andersen AFB, Joint Base Elmendorf-Richardson, and the 17 OWS at Joint Base Pearl Harbor-Hickam will appoint a MARK IVB METSAT Coordinator whose responsibility will be to ensure the local MARK IVB components and communications are operating properly and required maintenance is coordinated and performed. **(T-2)**. MARK IVB maintenance technicians assigned to Communications Squadrons at Kadena AB, Andersen AFB, Joint Base Elmendorf-Richardson and Joint Base Pearl Harbor-Hickam maintain the MARK IVBs. Successful exploitation of the TCRN MARK IVB sites requires close coordination between JTWC, MARK IVB METSAT Coordinators, and MARK IVB maintenance technicians.

9. TCRN Operation and Management

9.1. The JTWC Satellite Operations Flight will:

9.1.1. Conduct 24-hour meteorological watch on all tropical and subtropical disturbances within the JTWC AOR. **(T-2)**.

9.1.2. Report positions and intensity estimates on significant tropical cyclones in these regions using the format provided in Attachment 4. **(T-2)**.

9.1.3. Establish written procedures for conducting quality assessment (QA) of locally produced tropical cyclone position and intensity reports. **(T-2).**

9.1.4. Conduct on-the-spot QA of any tropical cyclone position and intensity reports to include those locally produced and those received from sources outside the JTWC. **(T-2)**.

9.1.5. Conduct after-the-fact product QA of locally produced tropical cyclone position and intensity reports. **(T-2)**.

9.1.6. Provide positions and intensities every three hours, or more frequently, as requested by the Typhoon Duty Officer (TDO). **(T-2)**.

9.2. JTWC SATOPS Flight Commander will:

9.2.1. Manage daily operations for tropical cyclone reconnaissance support within PACOM. **(T-2)**.

9.2.2. Communicate with Fielded Systems Support Center (FSSC) on Mark IVB maintenance and operations issues affecting PACAF. **(T-2)**.

9.2.3. Coordinate with FSSC on any additional operational satellite taskings and products. Users from other MAJCOMs should staff their request through FSSC who will, in turn, coordinate with JTWC through the SATOPS Flight. If requests from other MAJCOMs are received by the SATOPS Flight Commander from FSSC, the SATOPS Flight Commander will attempt to support these requests for missions after considering and balancing the assets available for tropical cyclone reconnaissance. **(T-2)**.

9.2.4. Provide an end-of-year storm summary of tropical cyclone position and intensity estimate accuracy relative to the JTWC final "best-tracks." This summary is contained within the Annual Tropical Cyclone Report (ATCR) and briefed at the Tropical Cyclone Conference. **(T-2)**. A history of ATCRs can be found at the following website: **https://nepoc.oceanography.navy.mil/portal/web/jtwc/tropical-cyclone**

9.2.5. Inform the Director, JTWC of changes in the overall status of the TCRN. **(T-2)**.

9.3. TCRN Backup Procedures.

9.3.1. In the event that JTWC cannot maintain responsibility as TCRN, position and intensity estimates of tropical and subtropical cyclones are available via the Global Telecommunications System (GTS) from the National Environmental Satellite, Data, and Information Service (NESDIS) Satellite Analysis branch and foreign agencies assigned as Regional Specialized Meteorological Centers (RSMC) or Tropical Cyclone Warning Centers (TCWC). JTWC will rely on these alternate sources of data until they can resume normal operations. **(T-2)**.

10. TCRN MARK IVB Geostationary and Polar Orbiting Satellite Assignment

10.1. Each TCRN MARK IVB has assigned geostationary satellites (Table 1). Andersen AFB and Joint Base Pearl Harbor-Hickam have two geostationary antennas, so they are assigned two primary satellites. This redundancy ensures JTWC has access to near real-time geostationary satellite data across the entire AOR. The MARK IVB METSAT Coordinator at each site (Kadena AB, Andersen AFB, Joint Base Elmendorf-Richardson, and Joint Base Pearl Harbor-Hickam) will dedicate their local geostationary antenna(s) to their assigned geostationary satellite(s), unless directed to change by JTWC. **(T-2)**. JTWC will coordinate with FSSC to ensure critical operational mission support continuity before satellite changes are made. **(T-2)**.

Table 1. TCRN MARK IVB Geostationary Satellite Assignments within PACAF.

Base	Geostationary Satellite Assignment	Alternate Satellite Assignment
Joint Base Pearl Harbor-Hickam	Himawari Series (Japan) GOES West (US)	N/A
Joint Base Elmendorf-Richardson	GOES West (US)	N/A
Andersen AFB	Himawari Series (Japan) COMS-1 (Korea)	N/A
Kadena AB	COMS-1 (Korea)	METEOSAT-7 DRO

Table 2. MARK IVB Sites Outside of PACAF.

Base	Geostationary Satellites Available
Kapaun Barracks (Germany)	METEOSAT-7,8,9 DVB (EU)
Lajes AB (Azores)	GOES East (US) METEOSAT-9 (EU)
Ali Al Salem AB (Kuwait)	METEOSAT-7 (EU)
Note: These sites are listed as informational only to reinforce the program's global nature. PACAF has no control or direction over these sites. However, JTWC can access imagery over the Indian Ocean from these sites.	

10.2. MARK IVB maintenance technicians at each site (Joint Base Pearl Harbor-Hickam, Joint Base Elmendorf-Richardson, Andersen AFB, and Kadena AB) are responsible for maintaining and moving the MARK IVB antenna only when requested to do so by the local MARK IVB METSAT Coordinator. Any maintenance requiring movement of the geostationary antenna or a change in geostationary assignment for the antenna will be coordinated by the local MARK IVB Coordinator with FSSC and JTWC. **(T-2)**.

10.3. Alternate Solutions to Mission Conflict.

10.3.1. The MARK IVB geostationary antennae may be programmed to alternate between the assigned primary and alternate satellites. Careful consideration must be given to the additional wear-and-tear on equipment caused by constant switching between geostationary satellites which can cause significant shortening of the antenna's life. The local MARK IVB METSAT Coordinator will coordinate this process with FSSC and JTWC prior to programming. FSSC may involve the Mark IVB contractor. **(T-2)**.

10.3.2. Polar orbiting satellite priorities are as follows: all Defense Meteorological Satellite Program (DMSP) then Suomi National Polar-orbiting Partnership (Suomi-NPP), National Oceanic Atmospheric Administration (NOAA), Meteorological Operational satellite programmer (METOP), National Aeronautics and Space Administration (NASA) Aqua (EOS PM-1), and NASA Terra (EOS AM-1) polar passes between 1 hour before and 30 minutes after the tropical cyclone warning time (in the warning window). Units

will follow the direction of FSSC or JTWC to temporarily modify this priority for special circumstances. **(T-2)**.

10.4. TCRN MARK IVB Scheduled Outages.

10.4.1. The local MARK IVB METSAT Coordinator at each TCRN MARK IVB site will:

10.4.1.1. Establish procedures with the local Base Network Control Center to ensure immediate notification of scheduled base network outages expected to impact external or internal access to their local MARK IVB server. **(T-2)**.

10.4.1.2. Establish procedures with the local MARK IVB maintenance technicians to ensure JTWC is immediately notified of scheduled maintenance expected to impact external or internal access to their local MARK IVB server or the reception and processing of satellite data. **(T-2)**.

10.4.1.3. Immediately notify FSSC of any scheduled network service outage or scheduled maintenance affecting access to their local MARK IVB. **(T-1)**.

10.4.2. JTWC will:

10.4.2.1. Weigh the impact of scheduled outages and make every possible effort to accommodate the requirements of each MARK IVB site. **(T-2)**.

10.4.2.2. Coordinate between FSSC and the local MARK IVB METSAT Coordinator to determine an estimated system down time and relate the impact of the outage for the purpose of aiding the Administrator in bringing the MARK IVB back into service. **(T-2)**.

10.4.3. The local MARK IVB maintenance technicians will notify the local MARK IVB METSAT Coordinator and FSSC of any scheduled maintenance impacting internal or external access to the local server, or the reception and processing of satellite data. **(T-2)**.

10.5. Unscheduled TCRN Service Outages.

10.5.1. The MARK IVB METSAT Coordinator will report local MARK IVB outages to FSSC. FSSC's current procedure is to open an internal trouble ticket and then notify the appropriate base Job Control Center and JTWC. The base Job Control Center will contact the local MARK IVB maintenance technician for repair of the system and provide updates to the local MARK IVB METSAT Coordinator upon request. **(T-2)**.

10.5.2. Each team of MARK IVB technicians is responsible for maintaining their systems to include: repair actions, system administration, coordination on connectivity issues, and coordination with other work centers when necessary. **(T-2)**.

10.5.3. MARK IVB maintenance technicians will perform preventative maintenance in accordance with the Mark IVB technical orders and notify the local MARK IVB METSAT Coordinator and FSSC of changes in system status, equipment status, and/or client access. **(T-2)**.

11. Radar Support and Data Collection.

11.1. Radar Reconnaissance. This section describes the role of USAF units in the Pacific Radar Tropical Cyclone Reporting System. The purpose of the reporting system is to ensure

that timely, high quality radar observations are made available to the JTWC. The storm fix is used to accurately initialize storm location, thus ensuring the most accurate forecast track. Refer to the NHOP (National Hurricane Operations Plan) WSR-88D Tropical Cyclone Operations Plan & Checklist to obtain the specific radar settings for your WSR-88D: **http://www.ofcm.gov/homepage/text/pubs.htm**.

11.2. JTWC Satellite Operations Flight will provide tropical cyclone position reports using the format prescribed in Attachment 3 whenever a tropical cyclone in the western North Pacific is first detectable by a National Weather Service (NWS) or USAF-owned WSR-88D radar. **(T-2)**. These and subsequent reports will be provided regardless of warning or condition of readiness status. **(T-2)**. Updates will be provided hourly thereafter near the top of the hour (following duty priorities) until the storm is no longer detected by the radar or drops below tropical depression strength. **(T-2)**. The Typhoon Duty Officer may request more frequent radar fixes due to unusual circumstances and the satellite analyst will accommodate as much as practical following duty priorities. The JTWC Satellite Operations Flight will ensure an appropriate number of personnel are knowledgeable of, and comply with, standard procedures for reporting tropical cyclones. **(T-2)**.

11.2.1. The JTWC Satellite Operations Flight will maintain the capability to archive, within Gibson Ridge software limits, the following radar products:

11.2.1.1. Base Reflectivity; .5 degree, 124 nm range, .54 nm resolution. **(T-2)**.

11.2.1.2. Base Reflectivity; 1.5 degree, 124 nm range, .54 nm resolution. **(T-2)**.

11.2.1.3. Base Velocity; .5 degree, 124 nm range, .54 nm resolution. **(T-2)**.

11.2.1.4. Base Velocity; 1.5 degree, 124 nm range, .54 nm resolution. **(T-2)**.

11.2.2. Local weather units (Table 3) with an OPUP/Gibson Ridge archive ability will maintain a backup capability to archive products listed in para 11.2.1.1. through 11.2.1.4., as requested by JTWC, if JTWC is unable to archive for their location. **(T-2)**.

Table 3. Active USAF Radar Sites and OPUP Gibson Ridge Locations.

UNIT	LOCATION
1 WS	* Joint Base Lewis-McChord, Washington
36 OSS/OSW	Andersen AFB, Guam
17 OWS	*Joint Base Pearl Harbor-Hickam, Hawaii
Det 2, 1 WS	*Wheeler AAF, Hawaii
18 OSS/OSW	Kadena AB, Japan
8 OSS/OSW	Kunsan AB, Korea
Det 2, 607 WS	USAG Humphreys, Korea (actual radar is 40 miles NE)
51 OSS/OSW	*Osan AB, Korea
OL-A, Det 2, 607 WS	*K-16, Korea
JTWC	*Joint Base Pearl Harbor-Hickam, Hawaii
	*** Locations with OPUP or Gibson Ridge only. Others have RDA.**

12. Tropical Cyclone (TC) Reporting.

12.1. When a TC of tropical storm strength or greater passes within 150 nm of a USAF military weather reporting organization in USPACOM, that organization will prepare a message and send it to JTWC within 24 hours of passage. **(T-2)**. The message will include the following:

12.1.1. Name of tropical cyclone. **(T-2)**.

12.1.2. Date and time of occurrence. **(T-2)**.

12.1.3. Closest point of approach (azimuth and range of storm center). WF/Dets/OLs may need to obtain this information from their respective OWS. **(T-2)**.

12.1.4. Maximum sustained wind. **(T-2)**.

12.1.5. Peak gust. **(T-2)**.

12.1.6. Minimum sea level pressure. **(T-2)**.

13. Tropical Cyclone Threat Assessment Product (TC-TAP).

13.1. 17 OWS issues TC-TAP IAW AFMAN 15-129V1. Exploitation units utilize TC-TAP IAW AFMAN 15-129V2. The following are PACAF-unique additions to TC-TAP.

13.1.1. 17 OWS will issue updated TC-TAPs within 90 minutes of receipt of an updated JTWC TC bulletin. **(T-2)**.

13.1.2. TC-TAP will include crosswind thresholds of 15 knots and 25 knots. **(T-2)**.

13.1.3. TC-TAP will include expected precipitation accumulation for each location. **(T-2)**.

13.2. 17 OWS uses HURRTRAK as the enterprise directed standard software for producing TC-TAPs.

14. Significant Event Reporting.

14.1. PACAF weather organizations will notify PACAF/A3TX concurrent with or as soon as possible after any reporting through local chain of command, regardless of day/time, upon learning of the following: **(T-2)**.

14.1.1. Significant operational incident related to weather conditions or weather services within their areas of responsibility. A significant operational incident is one that is formally reported by a base/post/installation through their respective command channels via operational reports (such as OPREPs and BEELINEs), or one that is reported through command or weather functional channels via other means which is likely to receive senior officer attention because it contains critical comments regarding weather services (for example, an email to a MAJCOM weather functional or the Air Staff).

14.1.2. Significant adverse incident involving weather personnel likely to gain publicity or visibility with civil or military law enforcement officials and likely to gain host-base wing commander or higher attention. For example, a base “blotter” entry represents a significant adverse personnel incident and should be reported, while a speeding ticket would not represent an incident applicable under this instruction.

14.2. AFMAN 15-129V2 requires active duty base/post weather flights to coordinate with OWSs when the flight learns of an operational incident. This coordination ensures a thorough and accurate account of weather conditions and weather services is provided to the host/parent unit submitting the report. This instruction requires the OWS to take the additional step of notifying PACAF/A3TX as soon as possible after notifying their chain of command whenever learning of an operational incident. OWSs are not expected to seek out or "shop for" potential incidents (OPREPs, etc.) solely based on the potential of an incident due to adverse weather conditions.

14.3. OWS weather forecasters and shift supervisors will remain vigilant for operational incidents at non-collocated Total Force units and provide that information to the Senior Duty Officer/NCO. **(T-2)**. The Senior Duty Officer/NCO will ensure the OWS initiates contact with the command post of the affected unit to coordinate weather information and notify PACAF/A3TX of the potential operational report after chain of command notifications are made. **(T-2)**.

15. Weather Technical Performance Evaluation. Until AF/A3W publishes an updated AFI 15-114 and PACAF/A3TX has had an opportunity to write its supplement, the following constitutes PACAF Weather Technical Performance Evaluation.

15.1. Verification metrics for Terminal Aerodrome Forecast (TAF) coded products are automated and available from the 17 OWS Local Intranet site. Contact 17 OWS to obtain permission to access this site. Verification metrics (WARNVER) for resource protection products (watches, warnings, advisories) are also automated and available through the Integrated Weather Warning Capability (IWWC) application on the Joint Environmental Toolkit (JET) Portal (**https://owsjet17.us.af.mil/**). All echelons within AFW with permissions can access these sites to download TAFVER and WARNVER metrics. There is no need for upward reporting of TAFVER and WARNVER metrics through PACAF/A3TX to AF/A3W. 17 OWS will courtesy copy PACAF/A3TX on any TAFVER or WARNVER metrics summaries/feedback provided to EUs. **(T-2)**.

15.2. All weather organizations (WFs, WSTs, WSs, OWSs) which issue Mission Weather Products (MWP) will maintain an Operational Verification (OPVER) program IAW AFI 15-114. As a minimum, the OPVER program will meet these requirements: **(T-2)**.

15.2.1. For each mission segment (launch, recovery, drop zone, target engagements, etc.), and for each airframe/squadron supported, keep count of number of missions briefed GO (forecast weather conditions favorable based on mission critical thresholds). Then determine how many of these GO forecasts were accurate (actual weather favorable based on mission critical thresholds, an observed GO) and how many were not accurate (actual weather unfavorable based on mission critical thresholds, an observed NO GO). Similarly, keep count of number of missions briefed NO GO (forecast conditions unfavorable based on mission critical thresholds). Determine how many NO GO forecasts were accurate (actual weather was unfavorable based on mission critical thresholds, an observed NO GO), and how many were not accurate (actual weather favorable based on mission critical thresholds, an observed GO).

15.2.2. A mission may consist of multiple aircraft if they receive a single MWP and are debriefed as a single mission. For multi-unit missions, the Lead Weather Unit will conduct OPVER on the Controlling Mission Weather Product (CMWP). **(T-2)**.

15.2.3. When determining if the observed weather was GO or NO GO, weather organizations will use information in the following priority: crew feedback, objective verification, subjective verification. Objective and subjective verification methods will be consistently applied. **(T-2)**.

15.2.4. Weather organizations will coordinate with supported warfighters to determine metrics to be computed and tracked, and to determine the impact of MWPs on mission success. Weather organizations will periodically inform their supported warfighters on the results of the OPVER program with emphasis on: **(T-2)**.

15.2.4.1. Advising supported warfighters on the status of weather products/services provided.

15.2.4.2. Identifying limitations to parent/host operations that could be mitigated based on application of environmental information.

15.2.4.3. Identifying opportunities for improvement.

15.2.5. Weather organizations are encouraged to evaluate the impact of other mission weather products on the one or two most important supported warfighter decision points. This too will require coordination with supported warfighters to determine which decision points are the most important and to collect the necessary feedback to evaluate the impact of the MWPs on mission success.

15.2.6. Weather organizations will forward to PACAF/A3TX by the 15th of the month the previous month's total data counts for data collected under paragraphs 15.2.1 and 15.2.5 above. **(T-2)**. Army weather support squadrons may compile OPVER data from their detachments/OLs and send consolidated totals. PACAF/A3TX compiles command metrics from this data to monitor, analyze, and evaluate the effectiveness of weather support within PACAF.

15.3. 17 OWS maintains a program to evaluate the accuracy of its regional graphics products and periodically makes program results available to weather organizations in the AOR, to include PACAF/A3TX.

16. Weather Equipment Outage Reporting.

16.1. PACAF weather organizations report weather equipment and communications outages IAW AFI 21-103. Also notify FSSC for outages of AFW fielded systems IAW AFMAN 15-129V2. PACAF weather organizations will maintain an outage log using PACAF Form 416, Weather Equipment/Communications Service Record or a locally developed outage log that contains the same information. **(T-2)**. Regardless of the outage log used, the following guidelines apply: **(T-2)**.

16.1.1. Use a separate form or sheet for each piece of weather equipment.

16.1.2. Compute outage times by subtracting the time between initial report and time returned to duty. Adjust times to reflect only the hours the organization is open.

16.1.3. Use the remarks section of the outage form to briefly describe the reason or cause of the outage. Follow-up actions must also be noted to provide documentation if historical data or contractor response information is needed to resolve unique problems.

At a minimum, daily updates should be logged and briefed during all shift changes and meteorological conferences (METCON).

16.1.4. For fixed weather sensing equipment outages at EUs that have airfield surface observing responsibility, log the time out and time in also on the AF Form 3803/AF Form 3813, Surface Weather Observations, Column 90.

16.2. PACAF weather organizations will report all long-term or expected long-term Red Outages (see AFI 21-103, paragraph 6.2) of more than 72 hours to PACAF/A3TX at **pacaf.a3txweather.1@us.af.mil**, or DSN (315) 448-1482. **(T-2)**. Additionally, organizations should report any other outages that merit higher headquarters involvement or awareness.

16.2.1. Provide sufficient information about the outage so that PACAF staff can adequately assist in outage resolution as required. This information should include the following: the POC's name, rank, e-mail address, organization, equipment or circuit description, date/time of outage, parts required/ordered, parts ordered Mission Capability (MICAP) (Y/N), Estimated Time in Commission (ETIC) and any other pertinent information.

16.2.2. Provide follow-up reports when there is a change in operational status, new information about the outage, or as requested by PACAF/A3TX. The final report should be sent when the outage has been resolved and should briefly describe the corrective action(s) taken.

16.3. PACAF weather organizations document maintenance support procedures in a local weather support document or letter of agreement, as appropriate. When developing the support concept and procedures, ensure the following are included: a POC for logging circuits and equipment in/out, acceptable maintenance response times, specific mission impact statements for each piece of equipment the organization uses, and equipment repair priorities. Equipment and communications used to directly support flight operations should be given the highest repair priority and the shortest response time, followed by OPLAN tasked tactical equipment, followed by all other weather equipment. **(T-2)**.

17. Back-up and Manual Observing Equipment/Procedures.

17.1. UTC-postured (deployable) AN/TMQ-53s are not meant to be used as the permanent base/post observing system. TMQ-53s may be used for short-term training, during exercises, or when required to back-up fixed base observing system (FBOS). WFs will notify PACAF/A3TX when utilizing the TMQ-53 as a back-up to the FBOS for more than 72 consecutive hours. **(T-2)**.

17.2. PACAF weather units with an airfield services function or mobility requirement will have weather technicians practice backup/manual observing procedures a minimum of one shift per quarter and document in individual training records. **(T-2)**. Training may occur concurrently during operations required to validate AOL procedures. These exercises fulfill the AFMAN 15-129 V2 requirements for weather technicians to perform semiannual operations checks of assigned deployable tactical meteorological equipment and ensure proficiency with the training and procedures used for alternate equipment/systems.

17.2.1. At a minimum, weather technicians must be able to prepare an observation containing the minimum required elements (i.e., wind speed and direction, prevailing visibility, present weather and obscurations, sky condition, temperature, dew point and altimeter setting) using backup equipment and procedures. Mandatory elements may be omitted from the observation if the necessary equipment is not available. Additional local requirements may be evaluated as established in local procedures (e.g., requesting KQ identifier)

17.2.2. Do not "log out" the airfield observing equipment during training exercises. The equipment and the Automated Distribution System (ADS) should remain in auto mode, transmitting under the airfield International Civil Aviation Organization (ICAO). Real-world augmentation of the airfield observing equipment always takes precedence over performing simulated back-up.

17.2.3. Any training or procedural trends noted by UTM or weather flight leadership that could possibly be crossfed to other PACAF weather units to improve operations should be transmitted to PACAF/A3TX for consideration and further dissemination.

DIRK D. SMITH, Brig Gen, USAF
Director of Air and Cyberspace Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTIVE INFORMATION

References

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AFI 10-401, *Air Force Operations Planning and Execution,* 7 December 2006

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AFI 21-103, *Equipment Inventory, Status, and Utilization Reporting,* 26 January 2012

AFMAN 15-111, *Surface Weather Operations,* 27 February 2013

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USPACOMINST 0539.2, Meteorological and Oceanographic (METOC) Support to Joint Operations in U.S. Pacific Command (USPACOM), 12 December 2014

USAF/A3/5 Memorandum, *Air Force Weather Deployment Posture for Strike Flying Squadrons*, 14 Jan 2014

Prescribed Forms

PACAF Form 413, *Tropical Cyclone Satellite Position/Intensity Log,* 8 April 2006

PACAF Form 416, *Weather Equipment/Communications Service Record,* 19 October 2005

Adopted Forms

AF Form 847, *Recommendation for Change of Publication,* 22 September 2009

Abbreviations and Acronyms

ACC—Air Combat Command

AEF—Aerospace Expeditionary Force

AFI—Air Force Instruction

AF—IT – Air Force – Input Tool

AFMAN—Air Force Manual

AFRC—Air Force Reserve Command

AFRIMS—Air Force Records Information Management System

AFW—Air Force Weather

ALCOM—Alaskan Command

AMC—Air Mobility Command

AMD—Air Mobility Division

AMOS—Automated Meteorological Observing System

ANG—Air National Guard

ANR—Alaskan NORAD Region

AOC—Air Operations Center

AOL—Alternate Operating Location

AOR—Area of Responsibility

AOS—Air Operations Squadron

ART—AEF Reporting Tool

ATC—Air Traffic Control

ATCR—Annual Tropical Cyclone Report

CAF—Combat Air Forces

CCMD—Combatant Command

CDC—Career Development Course

CFC—Combined Forces Command

CMO—Combined METOC Officer

CMWP—Controlling Mission Weather Product

COMUNC—Commander United Nations Command

CONPLAN—Concept Plan

CPA—Closest Point of Approach

CPHC—Central Pacific Hurricane Center

Det—Detachment

DMSP—Defense Meteorological Satellite Program

DOC—Designed Operational Capabilities

DoD—Department of Defense

DRRS—Defense Readiness Reporting System

DTG—Date Time Group

EU—Exploitation Unit

FBOS—Fixed Base Observing System

Flt—Flight

FSSC—Fielded Systems Service Center

GTS—Global Telecommunications System

GOES—Geostationary Operational Environmental Satellite

HAF—Headquarters, US Air Force

IAW—In Accordance With

ICAO—International Civil Aviation Organization

IDP—Installation Data Page

IFM—Integrated Flight Management

IFR—Instrument Flight Rules

JET—Joint Environmental Toolkit

JMO—Joint METOC Officer

JTF—Joint Task Force

JTWC—Joint Typhoon Warning Center

LWU—Lead Weather Unit

MAJCOM—Major Command

MCP—Main Command Post

METOC—Meteorological and Oceanographic

METSAT—Meteorological Satellite

MOA—Memorandum of Agreement

MOU—Memorandum of Understanding

MOUI—Memorandum of Understanding International

MTSAT—Multi-functional Transport Satellite

MWP—Mission Weather Products

NASA—National Aeronautics and Space Administration

NCOIC—Non-Commissioned Officer in Charge

NESDIS—National Environmental Satellite, Data, and Information Service

NHC—National Hurricane Center

NHOP—National Hurricane Operations Plan

NIPRNET—Non-Classified Internet Protocol Router Network

NLT—No Later Than

NOAA—National Oceanic and Atmospheric Administration

NORAD—North American Aerospace Defense Command

NWS—National Weather Service

OCP—Operational Command Post

OI—Operating Instruction

OIC—Officer in Charge

OL—Operating Location

OPLAN—Operations Plan

OPR—Office of Primary Responsibility

OPREP—Operational Report

OPSEC—Operations Security

OPUP—Open-System Principal User Processor

OPVER—Operational Verification

OSS—Operations Support Squadron

OSW—OSS Weather Flight

OT&E—Organize, Train & Equip

OWS—Operational Weather Squadron

PACAF—Pacific Air Forces

PACFLT—Pacific Fleet

PACOM—Pacific Command

PIREP—Pilot Report

QA—Quality Assurance

QTP—Qualification Training Package

RDS—Records Disposition Schedule

ROKAF—Republic of Korea Air Force

RP—Resource Protection

RSMC—Regional/Specialized Meteorological Center

SATOPS—Satellite Operations

SFA— Support Forces Antarctica

SMO—Senior METOC Officer

SNCO—Senior Non-Commissioned Officer

Suomi-NPP—Suomi-National Polar-orbiting Partnership

SWO—Staff Weather Officer

TAF—Terminal Aerodrome Forecast

TAFVER—Terminal Aerodrome Forecast Verification

TC—Tropical Cyclone

TCRN—Tropical Cyclone Reconnaissance Network

TC-TAP—Tropical Cyclone – Threat Assessment Product

TCWC—Tropical Cyclone Warning Center

TDO—Typhoon Duty Officer

TPFDD—Time Phased Force and Deployment Data

URL—Uniform Resource Locator

USA—United States Army

USAF—United States Air Force

USAG—US Army Garrison

USARAK—United States Army Alaska

USARPAC—United States Army Pacific

USFJ—United States Forces Japan

USFK—United States Forces Korea

USPACOM—United States Pacific Command

UTA—UTC Availability

UTC—Unit Type Code

VFR—Visual Flight Rules

WARNVER—Warning/Advisory Verification

WF—Weather Flight

WS—Weather Squadron

WSD—Weather Support Document

WST—Weather Specialty Team

Attachment 2

PACAF FORM 413, TROPICAL CYCLONE SATELLITE POSITION/INTENSITY LOG, COLUMN HEADINGS AND ENTRIES

Table A2.1. PACAF Form 413 *Tropical Cyclone Satellite Position Intensity Log* Column Headings and Entries.

COLUMN HEADING (In Sequence)	ENTRY
TROPICAL CYCLONE	Enter name and number of tropical cyclone
OB	Sequential number of observations for the tropical cyclone.
MONTH	Month of observation encoded in two digits.
DATE/TIME	6-digit Date Time Group (UTC). For polar orbiters, use the nodal crossing time. Compute the relevant nodal crossing time for descending orbits.
LAT (LaLaLaC)	Center position latitude to nearest tenth degree. C is the checksum. Circle N or S (North or South).
LON (LoLoLoLoC)	Center position longitude to nearest tenth degree. C is the checksum. Circle E or W (East or West).
PCN	Position Code Number. Enter odd numbers if gridding based on geography (circulation center is within 10 degrees of the gridded feature). Enter even numbers if gridding is ephemeris-based.
SBC WRAP / SHEAR DIST	Use the DT column corresponding to the amount of wrap on the Log10 spiral or the distance (NM) that the LLCC is sheared from/embedded into deep convection.
EYE	Enter either the VIS embedded distance or the EIR surrounding gray shade meeting the minimum width criteria. Enter the corresponding E# and the necessary Eye Adjustment Value from NOAA TR NESDIS 11.
CDO	Central Dense Overcast. Enter diameter (NM) of CDO.
EMB	Embedded Center. Enter the grayshade used and the distance (NM) from the center to the edge of that gray shade meeting the minimum distance criteria.
DATA-T COMP	Data-T computation. CF (central feature) + BF (banding feature) = DT.
CCC	Central Cold Cover. Check if CCC is observed.
TREND	Enter D (developed), S (steady) or W (weakened) followed by the rate of change. Use "+" for rapid rate of change, "-" for slow rate, or leave blank for a normal rate of change. Use the rules as outlined in NOAA TR NESDIS 11.
MET	Model Expected T#. Adjustment of the final intensity from 24hrs (18-30h) ago. MET is the T# based on the D,W, or S and the rate as noted in the previous column.
PT	Pattern T#. Based on the charts in NOAA TR NESDIS 11. Use the MET value derived from the previous column as a baseline and adjust if necessary.

DVORAK CODE	Intensity estimation code. T#/CI/Trend/Period. T# is the Final intensity number. CI = Current Intensity. Trend/Period is amount of Final T# change over a specified period (18-30 h). Example: T3.0/3.0/D1.0/24HRS.
STT	Short Term Trend. Used if systems change is < 18h. Also used to supplement the Trend encoded within the Dvorak Code. An example is when the Dvorak Code trend indicates no intensity change from 24 hours ago but the storm actually weakened (indicating the system has possibly peaked) within the last 12 hours.
SPACECRAFT	Enter the spacecraft number or name, the revolution number and the satellite sensor(s) used.
FIX TYPE	The type of center encoded in the Lat/Lon columns. Enter LLCC (Low Level Circulation Center), ULCC (Upper Level Circulation Center), or CSC (Cloud System Center).
FIX CODE	Enter the appropriate fix code.
REMARKS	Enter PBO (position based on) followed by the primary method used to position the circulation center, EYE, SBC, CDO, ANMTN, etc. Include qualifying parameters when applicable (eye diameter/definition, outflow patterns, etc.) If an intensity estimation was done, enter DBO (Dvorak based on) DT, PT or MET.
SITE FIXES	Check the column corresponding to the appropriate site. Use the blank column for other sites not listed.
INITIALS	Initials of the satellite analyst.

Attachment 3

SURFACE RADAR MESSAGE FORMAT (WEST OF 180°)

Figure A3.1. Surface Radar Message Format West of 180°.

A. BULLETIN HEADER. WOPA1 XXXX DTG (where XXXX is the reporting station's ICAO).

B. SITE IDENTIFICATION. Name of Radar Site Reporting.

C. TROPICAL CYCLONE ID. (*e.g.*, TY 30W (BOBBIE)).

D. DATE AND TIME OF FIX. Zulu time expressed as day, hour and minutes (*e.g.*, 300622Z).

E. LATITUDE OF FIX. Degrees and minutes of latitude (N or S) plus check sum of the digits (*e.g.*, 1410N/6).

F. LONGITUDE OF FIX. Degrees and minutes of longitude (E or W) plus check sum (*e.g.*, 14510E/1).

G. FIX ACCURACY. Fix accuracy of EYE or CENTER and noted as follows: good, fair, poor for accuracy within 5, 15, 25 nm or greater respectively; *e.g.*, EYE/FAIR, CENTER/POOR. **Note:** if CENTER is outside radar range, state as CENTER/EXTRAPOLATED.

H. EYE SHAPE/SIZE. Eye shape/size as follows:

If circular, report diameter (nm) and describe wall cloud as percent complete and average width; *e.g.*, CIRC/OPEN SW/80 PCT CLOSED/D/20. If eye is elliptical, report major and minor axes (NM); *e.g.*, ELIP AXIS 030/010. If concentric, report both inner and outer diameters; *e.g.*, CONC 4/20. If no eye is present or observed, enter N/A.

I. PAST MOVEMENT. Past movement = tddff: t = time interval for average (1 = 15 min, 2 = 30 min, 3,4,5,6, = 1,2,3,6 hours; dd = direction of movement from in tens of degrees; ff = speed of movement (knots); *e.g.*, 32812 (reads as the past 1-hour movement from 280 at 12 knots). If past movement is not available, enter N/A.

J. VELOCITY COUPLET. Velocity couplet defines the circulation center. If YES, use a velocity cross section to determine inbound and outbound low-level radial velocity maxima noting their speed and latitude (thousands of feet); *e.g.*, YES/INBND 70/5, OUTBND 65/7 (reads as inbound radial velocity maximum is 70 knots at 5000 feet, and outbound is 65 knots at 7000 feet). If a couplet is not present, enter NO, or if no WSR-88D is available, enter N/A.

K. REMARKS. Remarks to include any comments that amplify or clarify the radar fix;
e.g., BOTH VELOCITY MAX OCCUR IN WALL CLOUD, INBND
MAX AT LOWEST LVL OF X-SECTION.
SAMPLE REPORT
A. WOPA1 PGUA 300630Z
B. PGUA
C. TY 30W (BOBBIE)
D. 300622Z
E. 1410N/6
F. 14510E/1
G. EYE/FAIR
H. CIRC/OPEN SW/80 PCT CLOSED/D20
I. 32812
J. YES/INBND 70/5, OUTBND 65/7
K. BOTH VEL MAX OCCUR IN WALL CLOUD. INBND MAX AT LOWEST LVL OF X-SECT.

Attachment 4

SAMPLE TPXX BULLETIN FORMAT

Figure A4.1. Sample TPXX Bulletin Format.

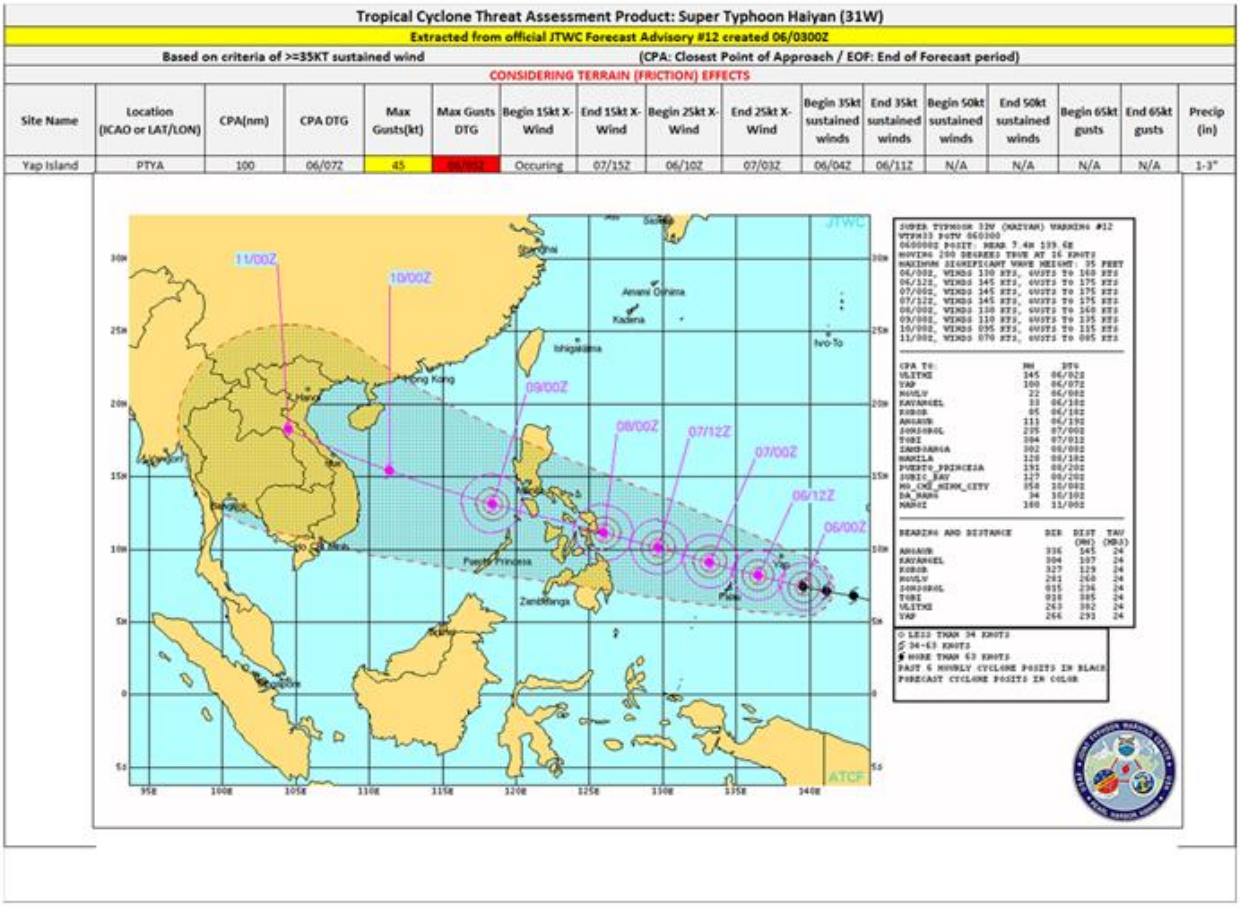
The following are examples of the TPXX bulletin.
TPPN10 PGTW 301845
A. TYPHOON 06W (NAKRI)
B. 30/1730Z
C. 17.9N
D. 133.1E
E. THREE/MTSAT
F. T5.0/6.0/W1.0/24HRS STT: W0.5/06HRS (30/1730Z)
G. IR/EIR
H. REMARKS: 13A/PBO BANDING EYE/ANMTN. CNVCTN WRAPS 1.60 ON LOG10 SPIRAL YIELDING A DT OF 4.5. MET AGREES. PT YIELDS A 5.0. DBO PT.
I. ADDITIONAL POSITIONS:
30/1545Z 17.8N 133.5E SSMI
30/1432Z 17.7N 134.0E AMSU
SMITH

TPXS10 PGTW 050428
A. TROPICAL DISTURBANCE 96S (E OF TANZANIA)
B. 05/0230Z
C. 7.7S
D. 41.6E
E. FIVE/MET7
F. T1.0/1.0/S0.0/24HRS STT: S0.0/06HRS (05/0230Z)
G. IR/EIR
H. REMARKS: 38A/PBO SBC/ANMTN.
I. ADDITIONAL POSITIONS:
05/0131Z 7.6S 41.9E AMSU
SMITH

Attachment 5

SAMPLE TC-TAP

Figure A5.1. Sample TC TAP.



Tropical Cyclone Threat Assessment Product: Super Typhoon Haiyan (31W)

Extracted from official JTWC Forecast Advisory #12 created 06/0300Z

Based on criteria of >=35KT sustained wind (CPA: Closest Point of Approach / EOF: End of Forecast period)

CONSIDERING TERRAIN (FRICTION) EFFECTS

Site Name	Location (ICAO or LAT/LON)	CPA(nm)	CPA DTG	Max Gusts(kt)	Max Gusts DTG	Begin 15kt X-Wind	End 15kt X-Wind	Begin 25kt X-Wind	End 25kt X-Wind	Begin 35kt sustained winds	End 35kt sustained winds	Begin 50kt sustained winds	End 50kt sustained winds	Begin 65kt gusts	End 65kt gusts	Precip (in)
Yap Island	PTYA	100	06/07Z	45	06/05Z	Occuring	07/15Z	06/10Z	07/03Z	06/04Z	06/11Z	N/A	N/A	N/A	N/A	1-3"